

# Copepods parasitic on South Indian Fishes: Family Anthosomidae—1

BY

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(With seven text-figures)

Anthosomid copepods of the genus *Lernanthropus* Blainville are extremely common gill parasites of the teleostean food fishes of this region but very few have so far been described. During the course of a year I have been able to collect a large number of species, of which eight are described here; four of them are new. In a previous publication (Pillai 1962) I described three species, one belonging to *Lernanthropus* and two to *Lernanthropodes* Bere.

## Genus *Lernanthropus* Blainville

### *Lernanthropus giganteus* Kroyer

*Lernanthropus giganteus* Kroyer, 1863, p. 280, pl. 8, figs. 1a-e; Wilson, 1913, p.227, pl. 33, figs. 148-150; Delamare-Douboutteville & Nunes-Ruivo, 1954, p.141.

**Remarks.** Wilson has given a detailed description and Delamare-Douboutteville & Nunes-Ruivo a detailed synonymy of this species and hence variations observed in my specimens alone are presented. Wilson has shown the posterior border of the dorsal plate of the female as faintly bilobed but described it as straight; it is straight in the present specimens. The antero-lateral lobes of the carapace reach the level of the antennal lobe and not beyond the latter as shown by Wilson. The long triangular postero-lateral processes of the anterior division of the trunk easily distinguish *L. giganteus*.

Length 7.1 mm.

38 females were collected by the author from the gills of *Caranx* sp. at Trivandrum.

### *Lernanthropus trifoliatus* Bassett-Smith

*Lernanthropus trifoliatus* Bassett-Smith, 1898, p. 11, pl. 7, f. 3. nec *Lernanthropus trifoliatus* Kirtisinghe, 1956, p. 18, f. 11.

Text-fig. 1

**Material.** 2 females from *Polynemus plebeius* (Broussonet), 8 females from *Polynemus sextarius* Bloch, and a large number of

females and males from *Polynemus heptadactylus* Cuvier were collected by the author at Trivandrum.

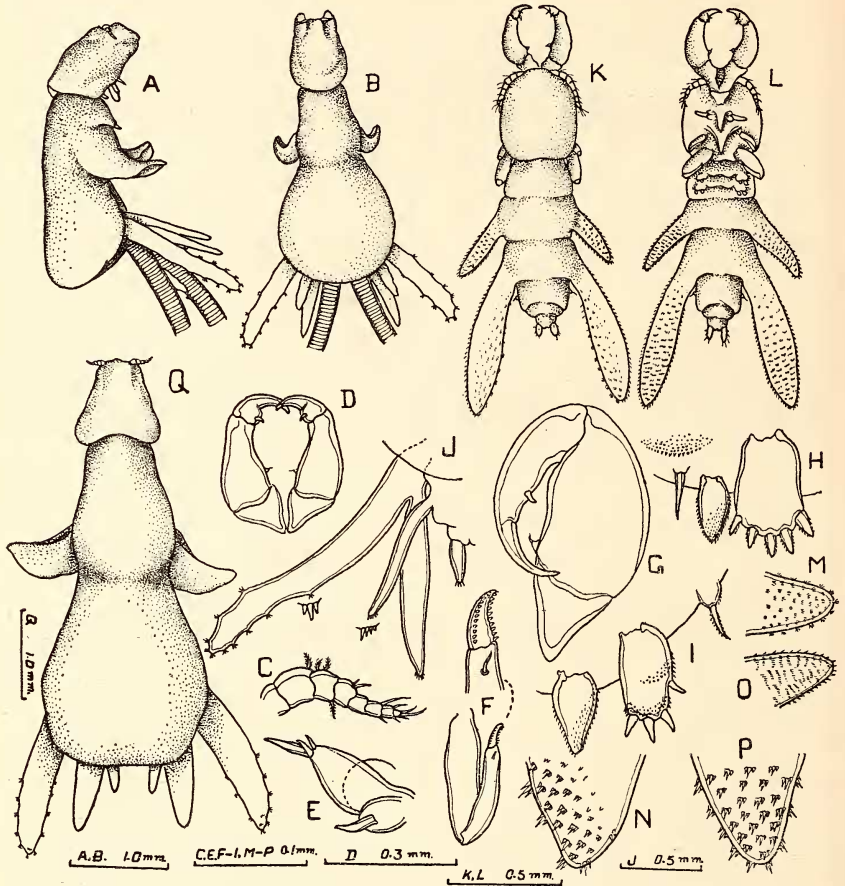


Fig. 1. *Lernanthropus trifolius* Bassett-Smith: A-J. female: A. lateral view; B. dorsal view; C. antenna 1; D. antenna 2; E. maxilla; F. maxilliped 1; G. maxilliped 2; H. leg 1; I. leg 2; J. posterior part of body showing legs 4, 5, and anal lamina. K-P. male: K. dorsal view; L. ventral view; M. tip of leg 3, dorsal view; N. tip of leg 4, dorsal view; O. tip of leg 3, ventral view; P. tip of leg 4, ventral view. Q. female from *Polynemus plebeius*

Female. Carapace longer than broad and posteriorly rounded, antennal area ill defined, antero-lateral parts produced into two prominent prolongations, lateral parts bent downwards. Anterior division of trunk rectangular, as long as carapace, with a slight bulging behind the position of the second legs. Dorsal plate rounded, longer than broad and demarcated from the anterior division of trunk by comparatively shallow lateral incisions. Genital segment fused with

the fifth trunk segment, abdomen small. Anal laminae long ovate, with a row of apical spinules.

First antenna seven-segmented. Second antenna prehensile, its basal segment with a proximal spine-tipped papilla, distal segment with a swollen base carrying a claw. Maxilla bilobed, inner lobe ovate and with a stout spine, outer lobe large, with three spines, one of them stout. Basal segment of first maxilliped not much stouter than distal, latter with a claw, unguis barbed on both edges. Basal segment of second maxilliped with a spine-tipped papilla, distal segment long and strongly falcate, with a claw-like spine in the middle.

First pair of legs with stout exopod carrying five teeth, endopod small, ovate and spiny, inner spine on basipod large, with a patch of spinules near its base. Second pair of legs with rectangular spiny exopod carrying four teeth, endopod similar to that of first leg, outer spine on basipod pectinate. Third leg uniramous and rolled up, directed at right angles to the long axis of the body and apically curved forwards. Fourth pair of legs biramous, exopod longer and stouter than endopod, its distal half with several groups of small teeth, endopod with an apical bunch of spines. Fifth leg uniramous, slender and tipped with a row of spines.

Length 3.4 mm.

**Male.** Carapace longer than broad and clearly demarcated from the trunk. Trunk segments indicated by lateral incisions and dorsal grooves. First two segments fused, equal to third, third and fourth segments subequal and rectangular. Fifth segment roughly squarish, with a pair of spine-tipped papillae. Genital segment small, immersed in fifth segment. Abdomen very small. Third pair of legs short, as long as the width of the segment. Fourth pair large, remotely club-shaped, both pairs with spiny surface. Anal laminae ovate, longer than broad.

Total length 1.2 mm.

**Remarks.** Bassett-Smith's description of this species was based on females and to my knowledge the male has not been described so far. As pointed out by Kirtisinghe, Bassett-Smith mistook the fifth leg for a third ramus of the fourth leg. The specimens Kirtisinghe assigned to this species are, however, totally different from those described by Bassett-Smith. A very prominent character of this species is the spinulation of the exopod of the fourth leg of the female. The groups of spines make the border so irregular that it is surprising that Bassett-Smith makes no mention of them. During the present investigation *L. trifolius* was found to parasitise three different but closely related species. The one figured here was from

*P. heptadactylus*. The size of the parasite was found to vary proportionately to the size of the host. In the large specimens, collected from *P. plebeius*, the exopod of the fourth leg is club-shaped. This species is apparently slightly variable.

### **Lernanthropus cornutus** Kirtisinghe

*Lernanthropus cornutus* Kirtisinghe, 1937, p. 448, figs. 88-98 ; Capart, 1953, p. 649; Delamare-Douboutteville & Nunes-Ruivo, 1954, p. 141.

#### Text-fig. 2

**Material.** Four females from the gills of *Tylosurus crocodilus* (Le Sueur) and 2 females and 1 male from the gills of *Belone* sp. were collected by the author at Trivandrum.

**Female.** Carapace roughly equal in length and breadth, regularly broadening backwards and postero-laterally produced into triangular apically blunt processes inclined backwards. Antennal area broad and folded downwards. Anterior division of trunk slightly longer than broad, roughly oblong, antero-median part produced into a conical prominence overlapping the carapace and continued backwards as a high median ridge reaching the hind border of the dorsal plate, the ridge progressively narrowing backwards. Dorsal plate demarcated from the anterior division of trunk by a mere lateral sinuosity, regularly broadening up to the middle, distal border roughly semicircular. Genital segment large, twice as broad as abdomen, abdomen slightly longer than broad.

First antenna small and indistinctly segmented. Second antenna strong, subequal in size to the second maxilliped, basal segment with the usual tubercle, distal segment stout, with a basal claw. Maxilla two-lobed, inner lobe not very much smaller than outer, prolonged into a conical spine, outer lobe with two spines. Unguis of first maxilliped with one inner and several outer rows of spines. Basal segment of second maxilliped oblong, claw of distal segment hook-like.

Exopod of first leg comparatively very large, with five dissimilar teeth, endopod small, with a long spine, setae on basipod large. Second leg very small, endopod larger than exopod. Third leg comparatively small, uniramous and folded as usual. Fourth leg biramous, not reaching the distal border of the dorsal plate, rami subequal, fusiform. Anal laminae ovate, with a spine-like apex.

Total length 4.2 mm.

**Male.** Cephalothorax almost equal in length and breadth, slightly broadening backwards and constricted in front to form an antennal area and behind to form a neck. First two trunk segments



indistinct, genital segment and abdomen together forming a narrow conical indistinctly segmented lobe. Anal laminae longer than broad, with two pectinate and three non-pectinate setae. Third leg

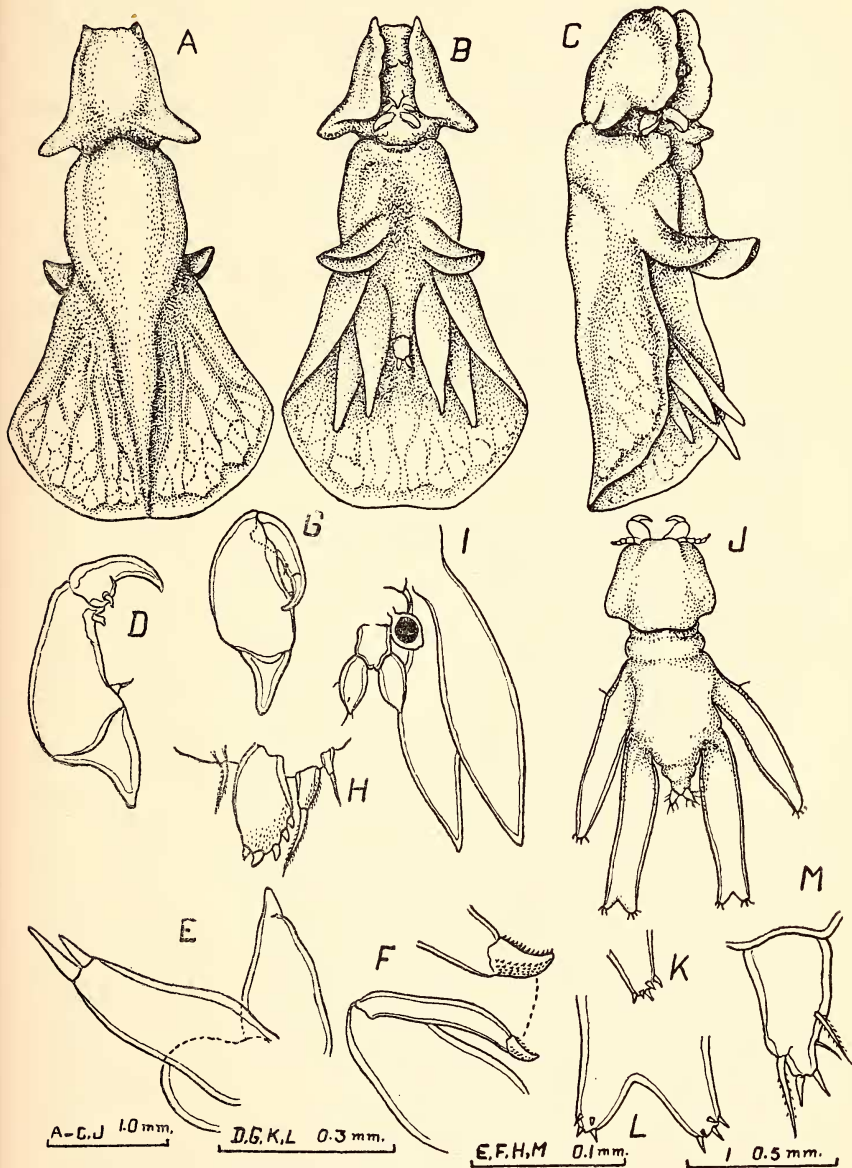


Fig. 2. *Lernanthropus cornutus* Kirtisinghe : A-J. female : A. dorsal view ; B. ventral view ; C. lateral view ; D. antenna 2 ; E. maxilla ; F. maxilliped 1 ; G. maxilliped 2 ; H. leg 1 ; I. posterior part of body showing leg 4 and anal laminae. J-M. male : J. dorsal view ; K. tip of leg 3 ; L. tip of leg 4 ; M. anal lamina.

long, tapering distally, base with one and apex with a bunch of short teeth. Fourth leg as long as third, parallel-sided and apically bifid, each ramus with an apical bunch of teeth.

Total length 2.1 mm.

**Remarks.** Kirtisinghe's description clearly applies to the present specimens except in the following characters. He has described the maxilla as two-jointed, basal segment spherical and with an accessory spine, and terminal segment smaller. As far as I could find this appendage is exactly as in other species, except that the inner lobe is comparatively large. It is possible that Kirtisinghe examined this appendage with the inner lobe lying over the outer. Kirtisinghe has described the fourth leg as projecting beyond the posterior border of the dorsal plate, but they are completely hidden under the dorsal plate in the specimens collected from *T. crocodilus* while in those collected from *Belone* they are as shown by Kirtisinghe. The latter specimens are larger than those from *Tylosurus*. Except that the third thoracic segment is clearly indicated and that the anal laminae carry spines, the present male is as described by Kirtisinghe.

### **Lernanthropus corniger Yamaguti**

*Lernanthropus corniger* Yamaguti, 1954, p. 387, figs. 35-41.

Text-fig. 3

**Material.** 43 females and 2 males were collected from the gills of *Megalaspis cordyla* (Linn.) by the author at Trivandrum. Allotype, male, is deposited in the Indian Museum, Calcutta.

**Female.** Carapace comparatively very large, subequal to the anterior division of trunk, with two lateral constrictions. Antennal area prominent but not produced, antero-lateral parts produced into large foliaceous lobes dorsally appearing as two acute horns reaching far beyond the frontal margin, posterior border of carapace convex. Anterior division of trunk roughly squarish, abruptly enlarged at the posterior half, antero-lateral parts rounded and shoulder-like. Dorsal plate completely covering the abdomen and anal laminae, roughly circular and as long as the anterior division of the trunk. Genital segment large, abdomen narrow, anal laminae long, each with three to four setae.

First antenna five-segmented, with long setae, third segment with a very long seta. Second antenna strong, basal segment stout, with a spine-tipped papilla, distal segment half as long as basal, with two claws, inferior distal part produced below the unguis into a flattened lobe with irregular border, unguis claw-like. Maxilla two

lobed, inner lobe with one and outer with three spines, one of the latter very large. Basal segment of first maxilliped stout, distal

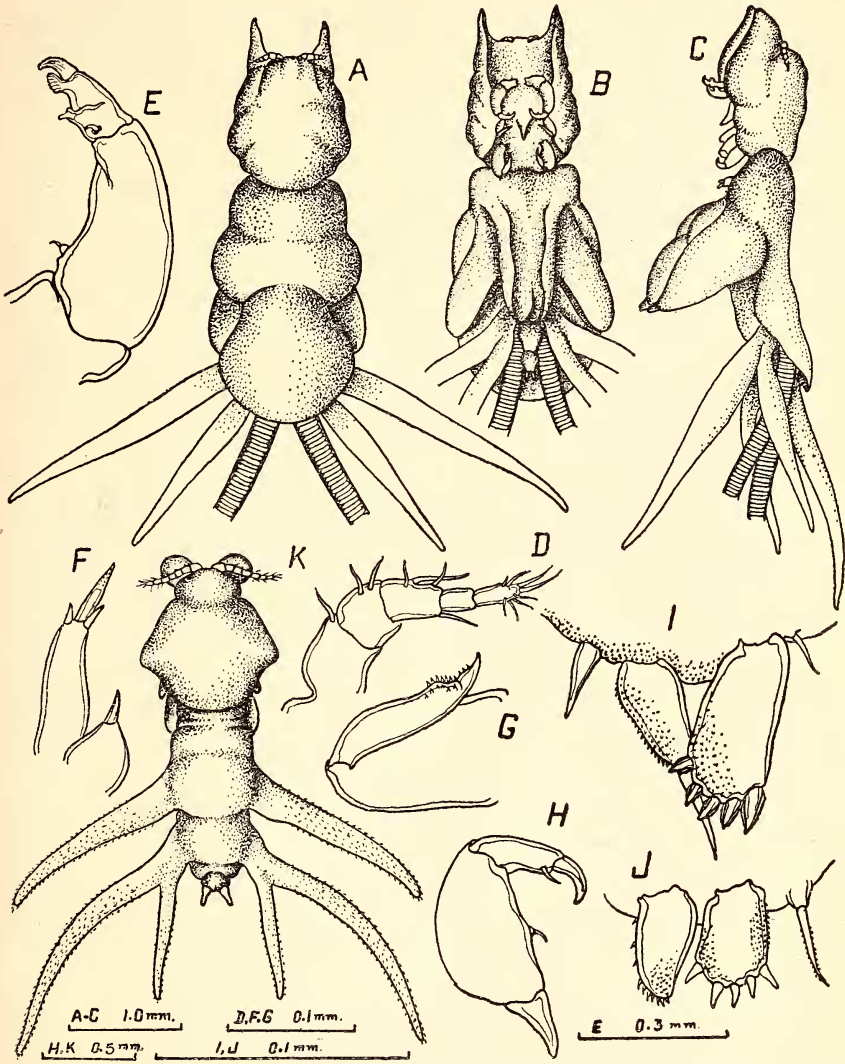


Fig. 3. *Lernanthropus corniger* Yamaguti: Female. A. dorsal view; B. ventral view; C. lateral view; D. antenna 1; E. antenna 2; F. maxilla; G. maxilliped 1; H. maxilliped 2; I. leg 1; J. leg 2. K. male

segment as long as basal, with a few sharp teeth at its inner distal part, unguis not clearly separated, with two to three teeth. Second maxilliped, as usual in the genus, uncinata, unguis strongly curved.

First pair of legs with a large exopod carrying five strong winged teeth, endopod with a stout spine, inner seta on basipod broad, outer

seta small, basipod and the rami spiny. Basipod of second leg with stout outer seta, exopod with five teeth, endopod spiny but without the apical spine. Third leg biramous, exopod folded and facing downwards, endopods of the two sides fused except at the tip, outer margin of endopods curved towards the venter, producing a semicircular channel. Fourth leg with long slender rami, endopod shorter than exopod. Fifth leg absent.

Total length 3.1 mm.

**Male.** Cephalothorax much broader than rest of body, median lateral parts angular, producing a diamond shape, antennal area demarcated into a well-delimited lobe, posterior border rounded. Thoracic segments indicated by dorsal grooves. Genital segment much broader than the one-segmented abdomen, anal laminae longer than abdomen. Third leg long, steadily narrowing towards the apex, its surface minutely spiny. Fourth leg biramous, outer ramus much longer than inner, both rami spiny like the third leg.

Total length 1.9 mm.

**Remarks.** Yamaguti's description was based on a single female. The present specimens show slight difference in the shape of the frontal horns, structure of the distal segment of the second antenna, and in the length of the fourth leg. The second segment of the second antenna has a claw in addition to the small tooth shown by Yamaguti and the unguis is clearly marked off. The rami of the fourth leg are slightly longer and more conspicuously narrowed distally. In Yamaguti's specimen the anal laminae are visible beyond the dorsal plate but they are hidden in my specimens.

This species can be distinguished from all the others by the long horn-like antero-lateral lobes of the carapace, which have suggested the specific name, and the peculiar modification of the distal segment of the second antenna. The laterally produced diamond-shaped carapace of the male is also very characteristic.

### ***Lernanthropus secutoris* sp. nov.**

Text-fig. 4

**Material.** 33 females were collected from the gills of *Secutor insidiator* (Bloch) by the author at Trivandrum. Holotype, female, is deposited in the Indian Museum, Calcutta (Reg. No. C. 4343/1).

**Female.** Body demarcated into three subequal parts, carapace, anterior division of trunk and dorsal plate. Carapace roughly triangular, narrowing backwards, antennal region demarcated by two shallow dorsal grooves, antero-lateral regions prominent and produced



into rounded lobes not much folded downwards. Anterior division of trunk broader than long, demarcated from the dorsal plate by shallow lateral incisions. Dorsal plate slightly longer than broad, as broad as thorax and posteriorly rounded, anal laminae projecting beyond

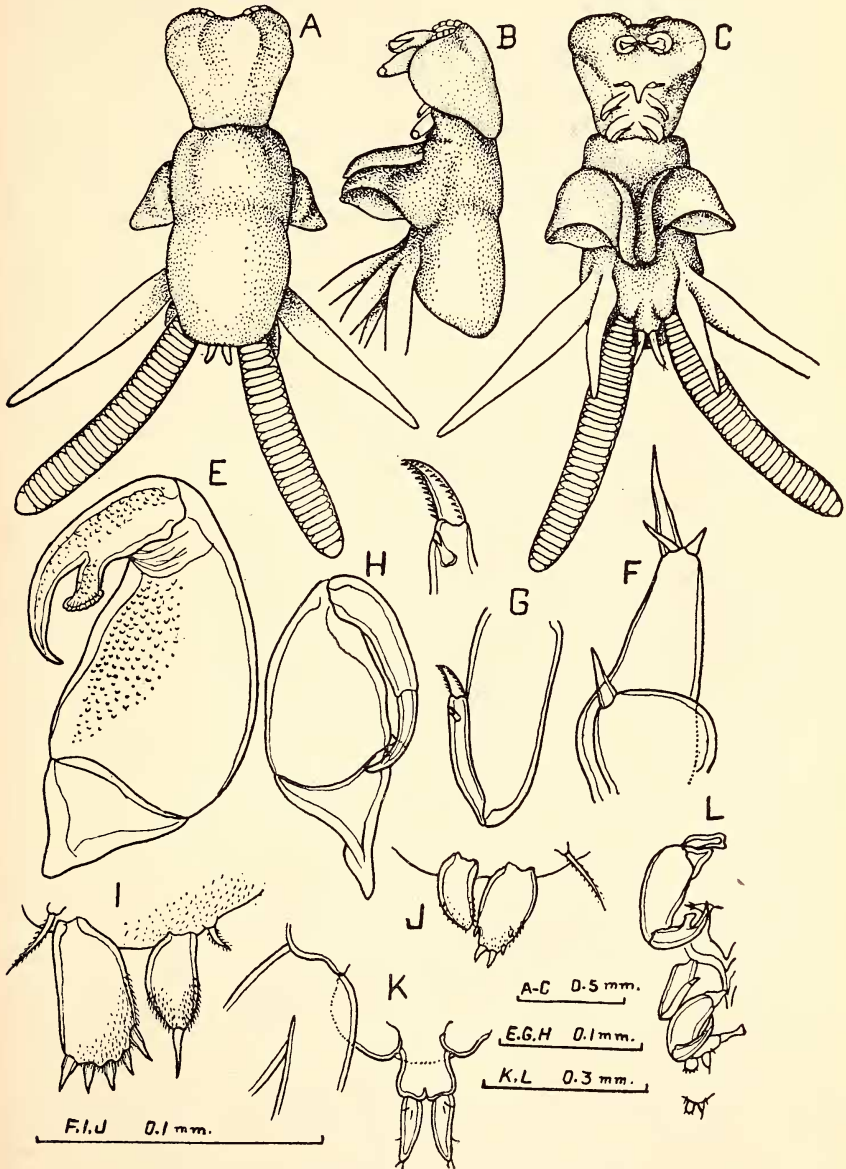


Fig. 4. *Lernanthropus secutoris* sp. nov.: Female. A. dorsal view; B. lateral view; C. ventral view; E. antenna 2; F. maxilla; G. maxilliped 1; H. maxilliped 2; I. leg 1; J. leg 2; K. posterior part of body; L. cephalic appendages

its posterior border. Genital segment very large, about three times as broad as abdomen. Egg sacs short and stout, with large eggs.

First antenna indistinctly seven-segmented. Second antenna with a large massive basal segment, its distal inner part pustulose, second segment strong and curved, with a large cylindrical and apically flared process at the middle of its inner side, obviously an extreme modification of the simple claw normally seen in this position. Inner lobe of maxilla with a sharp spine, outer lobe with a long spine and two short ones. First maxilliped with a stout basal segment, distal segment much shorter and narrower than basal, with a distal bifid claw, unguis with two rows of sharp teeth. Second maxilliped normal, with a slender strongly curved distal segment.

Exopod of first leg larger than endopod and armed with five sharp teeth and several small denticles, endopod denticulated and with a short apical spine. Second leg similar to first but smaller, endopod lacking the apical spine. Third leg uniramous, composed of two contiguously placed cups facing the posterior. Fourth leg biramous, exopod large, endopod half as long as exopod. Fifth leg absent. Anal laminae twice as long as abdomen.

Total length 1.3 mm.

**Remarks.** *L. secutoris* can be easily distinguished from all the other species by the triangular carapace narrowing backwards and by the oblong thorax. The egg tubes are unusually stout. The most distinctive character is the peculiar modification of the accessory claw on the distal segment of the second antenna, something even remotely resembling which is found only in *L. corniger* Yamaguti.

### ***Lernanthropus otolithi* sp. nov.**

Text-fig. 5

**Material.** 34 females were collected from the gills of *Otolithus argenteus* Cuvier by the author at Trivandrum. Holotype, female, is deposited in the Indian Museum, Calcutta (Reg. No. C.4344/1).

**Female.** Body clearly divisible into carapace, trunk, and dorsal plate. Carapace roughly circular and anteriorly trilobed, antennal lobe broader and projecting beyond the lateral lobes. Anterior division of trunk cylindrical, with subparallel sides, dorsal plate circular in outline. Genital segment, abdomen, and anal laminae hidden by the dorsal plate, abdomen long and two-segmented, first segment longer and broader than second. Genital segment short but broader than abdomen. Anal laminae long and slender, with two apical and two outer setae.

First antenna clearly seven-segmented, accessory process at its base strongly curved and with swollen base. Second antenna with stout basal segment, distal segment short, with a basal inner spine.

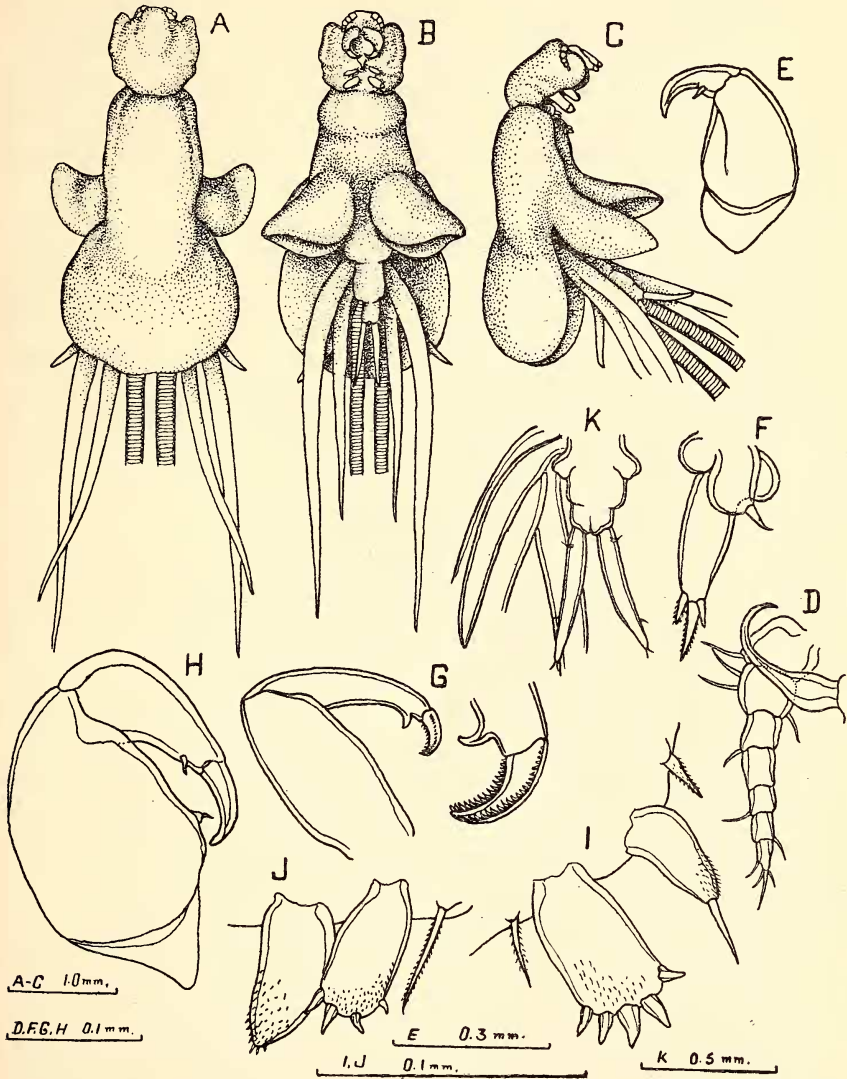


Fig 5. *Lernanthropus otolithi* sp. nov.: Female. A. dorsal view; B. ventral view; C. lateral view; D. antenna 1; E. antenna 2; F. maxilla; G. maxilliped 1; H. maxilliped 2; I. leg 1; J. leg 2; K. posterior part of body.

Inner lobe of maxilla small, with one spine, outer lobe long, with one long and two short spines. First maxilliped with segments subequal in length, distal segment with a strong claw-like accessory

process below the unguis, unguis with prominent marginal teeth. Second maxilliped with a very stout basal segment, distal segment proximally expanded, unguis distinct.

First leg with outer and inner pectinate setae, exopod stout, with five teeth, endopod with a single apical spine, both rami sparsely spinose. Second leg without inner seta, exopod with four teeth, endopod without spine, rami subequal in size. Third leg with rami completely fused and folded lengthwise. Fourth leg biramous, long and slender, exopod longer than endopod. Fifth leg uniramous, about half as long as the endopod of the fourth leg.

Total length 3.0 mm.

**Remarks.** This species shows the closest resemblance to *L. gisleri* van Beneden (1852) as described by Yamaguti (1936), which like the present is a parasite of sciaenid fishes. Both have the same type of carapace and trunk but in *L. otolithi* the dorsal plate is nearly circular while it is roughly parallel-sided in *L. gisleri*. Also in *L. otolithi* the exopod of the fourth leg is much longer than the endopod, but almost subequal in *L. gisleri*.

### ***Lernanthropus sillaginis* sp. nov.**

Text-fig. 6

**Material.** 41 females were collected from the gills of *Sillago sihama* (Forsk.) by the author at Trivandrum. Holotype, female, is deposited in the Indian Museum, Calcutta (Reg. No. C. 4345/1).

**Female.** Body stout, carapace nearly rounded, with distinctly demarcated antennal area, lateral parts forming prominent ventrally directed flaps projecting beyond the antennal area as small triangular lobes. Anterior part of trunk regularly widening backwards, as long as the carapace. Dorsal plate large, transversely expanded and roughly ovate, with evenly convex posterior border. Genital segment small, abdomen longer than broad, anal laminae slightly shorter than abdomen.

First antenna distinctly seven-segmented, with a few stout setae, fifth segment with a long stout seta, first segment large, seventh small. Basal segment of second antenna comparatively slender, with a proximal and a distal tubercle carrying a spinule, distal segment with a swollen base carrying a claw-like spine. Maxilla with a small inner and large swollen outer lobe, latter with one large and one small distal spine. First maxilliped slender, distal segment with a small spine, unguis with serrate edge. Second maxilliped with a comparatively very stout basal segment with one papilla, distal segment slender, with two spines, unguis very distinct.



First leg with large exopod carrying five spines, endopod oblong, with a long spine. Exopod of second leg with five spines, three of them very small, endopod considerably larger than exopod, with a

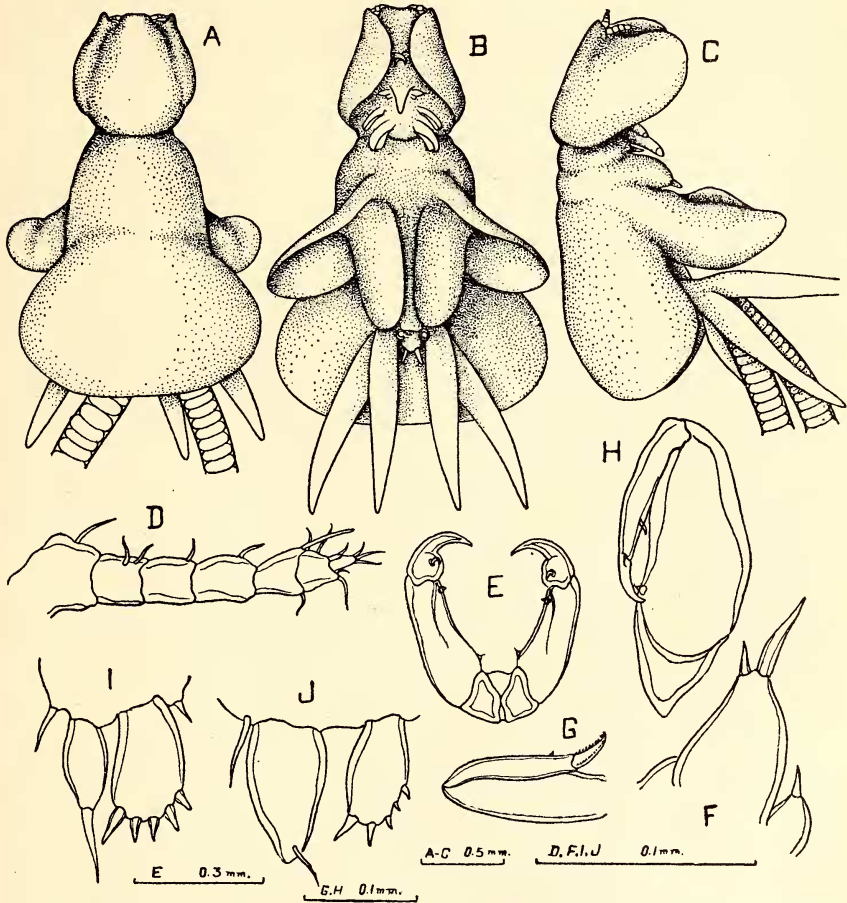


Fig. 6. *Lernanthropus sillaginis* sp. nov.: Female. A. dorsal view; B. ventral view; C. lateral view; D. antenna 1; E. antenna 2; F. maxilla; G. maxilliped 1; H. maxilliped 2; I. leg 1; J. leg 2.

slender seta. Third leg distinctly biramous, rami foliaceous, exopod folded over the linguiform endopod. Fourth leg comparatively short, with subequal rami, half of the rami projecting beyond the dorsal plate. Eggs comparatively large.

Total length 2.5 mm.

Remarks. In general appearance and in the structure of the appendages this species resembles *L. villiersi* Delamare-Douboutteville & Nunes-Ruivo (1954), but in the latter species the dorsal plate has a very distinct postero-median incision and the endopods of the third

pair of legs are fused. In *L. sillaginis* the dorsal plate has an entire posterior border and the endopods of the third pair of legs are completely free.

### **Lernanthropus triangularis** sp. nov.

#### Text-fig. 7

**Material.** 2 females and 1 male were collected from the gills of *Gerres filamentosus* Cuvier by the author at Trivandrum. Holotype (Reg. No. C. 4346/1), female and allotype (Reg. No. C. 4347/1), male, are deposited in the Indian Museum, Calcutta.

**Female.** General shape of body elongate-triangular. Carapace triangular, with the postero-lateral parts slightly produced, making the posterior border concave. Antennal area fairly broad, antero-lateral parts hardly produced. Anterior division of trunk regularly broadening backwards, demarcated from the dorsal plate by a distinct lateral incision and indistinct dorsal transverse grooves. Dorsal plate nearly rectangular, broader than anterior part of trunk, its posterior border nearly straight. Genital segment large, abdomen short. Anal laminae as long as abdomen, with one distal and two proximal setae.

First antenna distinctly seven-segmented, sparsely setose, accessory process at its base long and apically slightly curved. Second antenna comparatively slender, distal segment stout, with a claw and a spine, apical part of the segment strongly curved. Maxilla two-lobed, inner lobe with one and outer with three spines. Distal segment of first maxilliped with a very small tooth and a spine, unguis with serrate border. Basal segment of second maxilliped very stout, distal segment slender, with two spines on the inner border, unguis long.

Basipod of first leg with both inner and outer setae, exopod larger than endopod, with five subsimilar teeth, endopod spiny, with a long apical spine. Second leg with subequal spiny rami, exopod with four teeth, endopod with a very small spine seta. Third leg small, rami partially fused, exopod facing forwards and endopod backwards. Fourth leg biramous, reaching beyond the dorsal plate by about half their length, exopod slightly longer than endopod. Fifth leg absent.

Total length 2.4 mm.

**Male.** Body subcylindrical, carapace ovate, narrower in front, antennal area slightly indicated. Trunk demarcated into four indistinct thoracic segments, genital segment and abdomen partially fused. First antenna prominently setose. Second antenna slender and very long, strongly prehensile. Third leg biramous, endopod indicated by

a mere lobe. Fourth leg twice as long as third, endopod half as long as exopod.

Total length 2.4 mm.

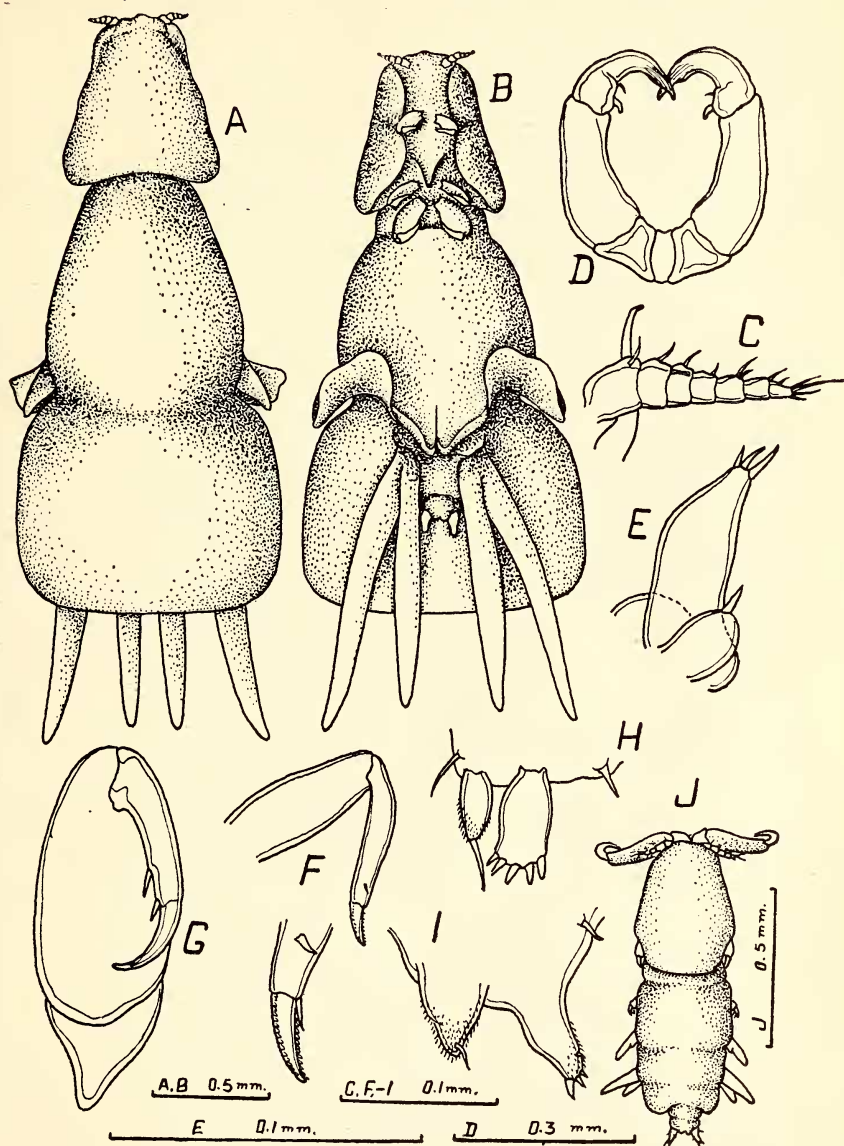


Fig. 7. *Lernanthropus triangularis* sp. nov.: A-I. female: A. dorsal view; B. ventral view; C. antenna 1; D. antenna 2; E. maxilla; F. maxilliped 1; G. maxilliped 2; H. leg 1; I. leg 2. J. male

Male. Body subcylindrical, carapace ovate, narrower in front, antennal area slightly indicated. Trunk demarcated into four indis-

tinct thoracic segments, genital segment and abdomen partially fused. First antenna prominently setose. Second antenna slender and very long, strongly prehensile. Third leg biramous, endopod indicated by a mere lobe. Fourth leg twice as long as third, endopod half as long as exopod.

Total length 0.9 mm.

**Remarks.** This species shows a superficial resemblance to *L. sciaenae* Gnanamuthu (1947). In the latter species the fifth leg, which Gnanamuthu seems to have mistaken for a third ramus of the fourth leg, is present but absent in *L. triangularis*. Because of the lack of details further comparison is difficult.

#### REFERENCES

- BASSETT-SMITH, P.W. (1898): Some copepods of fish from Ceylon. IV. *Parasitology* 46: 15-21.
- KROYER, H. (1863): Bidrag til Kundskab om Snyltekrebsene. *Naturh. Tidsskr.* 2: 75-426.
- CAPART, A. (1953): Quelques copepod-  
es parasites de poissons marine de la  
region de Dakar. *Bull. Inst. Franç.  
Afriq. Noire* 15: 647-671.
- DELAMARE-DOUBOUTTEVILLE, Cl. &  
NUNES-RUIVO, P. (1954): Parasites de  
poissons de mer ouest-africains recoltés  
par M.J. Cadenat. II. Copepodes genres  
*Lernanthropus*, *Sagum*, *Paeon*, *Penella*.  
*Bull. Inst. Franç. Afriq. Noire* 16:  
139-166.
- GNANAMUTHU, C.P. (1947): *Lernan-  
thropus sciaenae* sp. nov. a copepod  
parasitic on the gills of the fish *Sciaena  
glauca* from Madras. *Rec. Ind. Mus.*  
45: 291-298.
- KIRTISINGHE, P. (1937): Parasitic  
copepods of fish from Ceylon. II.  
*Parasitology* 29: 435-452.
- (1956): Parasitic  
copepods of fish from Ceylon. IV.  
*Parasitology* 46: 15-21.
- PILLAI, N.K. (1962): Three new antho-  
somid copepods parasitic on South  
Indian fishes. *J. Parasitology* 48(4): 613-7.
- WILSON, C.B. (1913). Crustacean para-  
sites of West Indian fishes and land crabs,  
with descriptions of new genera and  
species. *Proc. U.S. Nat. Mus.* 44:  
189-277.
- YAMAGUTI, S. (1936): Parasitic cope-  
pods from fishes of Japan. Part. III.  
*Caligoida* 2: 1-18.
- (1954): Parasitic copepods  
from fishes of Celebes and Borneo. *Publ.  
Seto Mar. Biol. Lab.* (3) 3: 375-398.
- VAN BENEDEN, P.J. (1852): Notes sur  
quelques parasites d'un poisson rare sur  
nos cotes (le maigre d'Europe) *Sciaena  
aquila* Cuv. *Bull. Acad. Belgique* 19:  
1-7.